IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of: **Yutaka MATSUOKA et al.** Art Unit: **1794**

Application Number: **10/567,152** Examiner: **Vivian Chen**

Filed: **July 10, 2008** Confirmation Number: **4579**

For: **COATING MATERIAL COMPOSITION WITH GAS-BARRIER PROPERTY PROCESS FOR PRODUCING THE SAME AND GAS-BARRIER PACKAGING CONTAINER OBTAINED THEREFROM**

Attorney Docket Number: **062003**
Customer Number: **38834**

DECLARATION UNDER 37 C.F.R. §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Yutaka MATSUOKA, a citizen of Japan, hereby declare and state the following:

1. I graduated from Tokyo University of Science and received a Master degree in engineering in March 1995.

2. I have been employed by SAKATA INX CORP. from April 1995 to present, where I have held a position in research and development for gas-barrier coating compositions since April 2001.

3. I have read and am familiar with the above-identified application as well as the Official Action dated January 25, 2010 and the Advisory Action dated May 17, 2010.

4. I have read and am familiar with the contents of cited references, JP 11-246728 and US 5,766,751 to Kotani et al in the Official Action in the above-identified application.

5. Under my supervision and control, I conducted experiments to obtain data shown below.

<A detailed experimental procedure>

In this declaration, "%" and "part(s)" means "mass %" and "part(s) by mass", respectively, unless otherwise specified.

Preparation of EVOH solutions

Preparation Example 1

To 60 parts of a mixed solvent composed of 50% of purified water and 50% of isopropyl alcohol (IPA) was added 30 parts of EVOH (product name: "SoarnoL(R) D-2908", product of Nippon Synthetic Chemical Industry Co., Ltd.), followed by further addition of 10 parts of a 30% aqueous solution of hydrogen peroxide. The mixture was warmed to 80°C with stirring and the reaction was allowed to proceed for about 2 hours.

Then, after cooling, catalase was added to a concentration of 3000 ppm to thereby eliminate the residual hydrogen peroxide. In this manner, an almost transparent EVOH solution (solution 1) with a solid content of 30% was obtained.

Preparation of EVOH solutions

Preparation Example 3

To 45 parts of a mixed solvent composed of 50% of purified water and 50% of isopropyl alcohol (IPA) was added 45 parts of EVOH (product name: "SoarnoL(R) D-2908", product of Nippon Synthetic Chemical Industry Co., Ltd.), followed by further addition of 10 parts of a 30% aqueous solution of hydrogen peroxide. The mixture was warmed to 80°C with stirring and the reaction was allowed to proceed for about 2 hours.

Then, after cooling, catalase was added to a concentration of 3000 ppm to thereby eliminate the residual hydrogen peroxide. In this manner, an almost transparent EVOH solution (solution 3) with a solid content of 45% was obtained.

Preparation of an inorganic layered compound dispersion

Preparation Example 1

5 parts of the inorganic layered compound montmorillonite (product name: "Kunipia F", product of Kunimine Industries Co., Ltd.) was added to 95 parts of purified water with stirring and sufficiently stirred for effecting dispersion using a high-speed stirrer. Thereafter, the mixture was kept at 40°C for 1 day. An inorganic layered compound dispersion (dispersion 1) with a solid content of 5% was thus obtained.

Preparation of an inorganic layered compound dispersion

Preparation Example 2

10 parts of the inorganic layered compound montmorillonite (product name: "Kunipia F", product of Kunimine Industries Co., Ltd.) was added to 90 parts of purified water with stirring and sufficiently stirred for effecting dispersion using a high-speed stirrer. Thereafter, the mixture was kept at 40°C for 1 day. An inorganic layered compound dispersion (dispersion 3) with a solid content of 10% was thus obtained.

Experimental Example 4

(Ethylene-vinyl alcohol copolymer (A) / inorganic layered compound (B) = 40/60)

1.4 parts of the EVOH solution 1 was added to 86.6 parts of a mixed solvent

composed of 50% of purified water and 50% of IPA, followed by stirring for thorough blending. Furthermore, 12 parts of the inorganic layered compound dispersion 1 was added to the above solution with stirring at a high speed, and the resulting mixture was subjected to dispersion treatment at a pressure set at 50 MPa in a high-pressure dispersing device. The thus-obtained coating material composition with a gas-barrier property with a solid content ((A) + (B)) of 1% was homogeneous and stable.

Experimental Example 5

(Ethylene-vinyl alcohol copolymer (A) / inorganic layered compound (B) = 50/50)

17.8 parts of the EVOH solution 3 was added to 2.2 parts of a mixed solvent composed of 50% of purified water and 50% of IPA, followed by stirring for thorough blending. Furthermore, 80 parts of the inorganic layered compound dispersion 2 was added to the above solution with stirring at a high speed, and the resulting mixture was subjected to dispersion treatment at a pressure set at 50 MPa in a high-pressure dispersing device. The thus-obtained coating material composition with a gas-barrier property with a solid content ((A) + (B)) of 16% was homogeneous and stable.

Gas-barrier layer formation with the compositions of Experimental Examples 4 and 5

Each of the coating material compositions with a gas-barrier property of Experimental Examples 4 and 5 was filtered through a 255-mesh filter, and the filtrate was applied, with a bar coater, to an OPP film (product name: "PYLEN P-2161", product of Toyobo Ltd., thickness: 25 μm) coated with a urethane type anchor coat agent to a gas-barrier layer thickness set at 0.3 μm or 1.0 μm as a dry film thickness.

Evaluation methods

(1) Oxygen transmission rate

Oxygen transmission rate (OTR value) measurements were carried out according to JIS K 7126 Method B using an oxygen transmission rate test system (product name: "OX-TRAN 100", product of Mocon Inc.). As for the measurement conditions, the tests were carried out in an atmosphere of 23°C and 80% RH (relative humidity).

(2) Transparency

The transparency of each of the coated articles was evaluated by the eye. The following three grades were employed in making a judgment based on the condition of the test article: A: equivalent to the base material; B: nearly transparent; C: cloudy.

(3) Adhesion to the base material

X-shaped cuts, about 3 to 4 cm in length, were made in the surface of each thin film coating with a cutter knife, and an adhesive tape was put thereon. The adhesive tape affixed was peeled off at a stroke, and the state of peeling off of the thin coating layer was observed by the eye. Based on that state of peeling, the judgment was made in two grades: A: no peeling at all; B: peeling observed.

The results of these evaluations are shown below in Table 1.

Results

The results obtained are shown in Table 1.

Table 1

	Layer thickness (μm)	Oxygen transmission rate ($cm^3 \cdot m^2 \cdot day \cdot kPa$)		Transparency	Adhesion to base material
		Measured value	Reduced value*1		
Base Material OPP	–	1.78×10^{1}	–		
Experimental Example 4	0.3	1.82×10^{-1}	5.46×10^{-2}	A	A
	1	1.61×10^{-1}	1.61×10^{-1}	B	A
Experimental Example 5	0.3	1.85×10^{-1}	5.55×10^{-2}	A	A
	1	1.60×10^{-1}	1.60×10^{-1}	B	A

In Table 1 given above, the "reduced value*1" is the oxygen permeability value calculated under the assumption that the gas-barrier layer thickness is 1μm.

From Table 1, it is evident that the coating material compositions with a gas-barrier property of Experimental Examples 4 and 5, even when applied to form a layer with a thickness as thin as 0.3 μm, provided sufficient gas-barrier properties and could maintain the transparency at a level almost the same as that of the base material film.

6. From the attached experimental results, I have concluded, among other things, that the coating material compositions having a mass ratio (A)/(B) within the range of (30/70) to (50/50) provides unexpectedly improved results even when the total amount of (A) and (B) is varied within the range recited in claim 1.

7. The undersigned declares that all statements made herein of his own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that willful false statements may jeopardize the validity of the application or any patent issued thereon.

Yutaka Matsuoka
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Signed this 23 day of June, 2010.